DEPARTMENT OF AGRICULTURE, CEYLON.

BULLETIN No. 33.

MEASUREMENTS OF "BARK RENEWAL" IN HEVEA.

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DEPARTMENT OF AGRICULTURE, CEYLON. BULLETIN No. 33.

MEASUREMENTS OF "BARK RENEWAL" IN HEVEA.

N previous Bulletins the writer has given an account of various experiments which have been made with the object of ascertaining the effects of tapping systems on the physiological processes of the rubber tree. The results of these experi-

ments enabled us to draw certain conclusions as to the probable effects of various types of tapping systems, particularly as regards the rapidity of renewal of tapped cortex.*

It may be admitted that the examination of the cortex and wood of tapped trees for the presence of starch and sugar has only led to general results.

Beyond a certain point, the differences in the types of results obtained are too small to enable us to draw very definite conclusions. It was, therefore, decided to carry out a number of measurements of the thickness of bark of different ages of renewal tapped by various systems, with the object of throwing more light on questions which have already been discussed in connection with the effects of various tapping systems on the starch reserves of the tree. In this, as in most other similar experiments on estate trees, the efficiency of the investigations is impaired by the difficulty of obtaining reliable details as to the individual history of each tree.

The measurements described in the following pages were carried out on trees the history of which was known with some certainty. The measurements were carried out with the Tromp de Haas Bark Measuring Gauge. The limit of accuracy was found to be 1 millimetre. The results have been classified under the following headings:—

- (1) Old mixed tapping.
- (2) One cut on one-quarter of the tree's circumference. Tapped daily.

^{*} Popularly termed " bark," though this expression is a misnomer. 6(8)17

- (3) Two cuts on one-quarter of the tree's circumference. Tapped on alternate days. One quarter tapped each year.
- (4) One cut on one-third of the tree's circumference. Tapped daily.
- (5) One cut on one-half of the tree's circumference. Tapped daily.
- (6) One cut on one-half of the tree's circumference. Tapped on alternate days.
- (7) One cut on one-half of the tree's circumference. Tapped on alternate days. Tapping transferred to the other side of the tree every six months.
- (8) Two V cuts on one-half of the tree's circumference. Tapping transferred to the other side of the tree about every six months.

(1) Old Mixed Tapping.

These measurements were made on old trees which had been tapped by various methods from time to time, the object being to ascertain the type of renewal that may be expected in such cases.

Tree No. 1.

The tree was about sixteen years old at the time of examination. The girth at 3 feet above ground level was 52½ inches.

Tapping was commenced when the tree was eight years old, the method being that of separate incisions, and not paring. After this it was tapped by three cuts, the top one being 54 inches from the ground and the other two 18 inches apart. Though tapped on one-half the tree's circumference, a 2-inch vertical strip was left between the tapped areas. These cuts were changed over to the other side of the tree every six months. This system of tapping was carried out during the fifth and fourth years before examination. After this two of the cuts were discontinued.

"Bark" measurements :--

Thickness of untapped bark above tapped area ... 11

Do. below do. ... 13

Thickness of renewed bark on top tapped area (5 years) ... 8-9

Do. middle do. (4 years) ... 7

Do. bottom do. (2 years) ... 5

Thickness of renewed bark tapped three years before ... 6-5

Tree No. 2.

The history of this tree was similar to that of No. 1.

Girth at 3 feet from th	e ground					ches. 493
				M	illin	netres.
Thickness of untapped	"bark" abo	ve tappe	l area			10
Do.		ow id				10
Thickness of renewed "	bark" on arc	a tapped	5 year	s bef	ore	7
Do.	do.	• • •	4	do.		6
Do.	do.		2-1	do.	• •	5

Tree No. 3.

This tree was about twenty-two years old at the time of examination. It had first been tapped up to a height of 20 feet, and subsequently with five cuts up to a height of 5 feet above ground level, since when it had been tapped continuously with a decreasing number of cuts.

The girth at 3 feet from the ground was $47\frac{1}{2}$ inches.

The "bark" was everywhere 5 millimetres thick, excepting where tapped during the last three months. There was no untapped "bark" in the lower part of the trunk.

Tree No. 4.

The history of this tree was similar to that of No. 3.

The girth at 3 feet from the ground was 41 inches. The renewed "bark" at 5 feet above ground level was 6.5 millimetres thick. Lower than this it was 5 millimetres thick, except where tapped during the last three months.

Tree No. 5.

The history of this tree was similar to that of Nos. 3 and 4. The girth at 3 feet from the ground was $42\frac{1}{4}$ inches.

The thickness of renewed bark at 5 fect from the ground was 6 millimetres. Lower than this it was from 5-6 millimetres. The thickness of untapped bark at the base of the tree was 10 millimetres.

"Bark" of five years' renewal on tree No. 1 was 83 per cent. of the thickness of neighbouring untapped bark. Bark of two years' renewal was 54 per cent. of the thickness of untapped bark.*

Very similar figures were given by tree No. 2, except that the bark which had been renewing for five years was only 70 per cent. of the thickness of the untapped bark. The corresponding figure for bark of from one to two years' renewal was 50 per cent.

The measurements taken on trees Nos. 3, 4, and 5 should give us some indications of what type of bark renewal may be expected of old severely-tapped trees. All the lower parts of the trunk had been tapped, and the renewing bark was from 5 to 6 millimetres thick.

In one case some untapped bark was available, and was found to be 10 millimetres thick.

Tapping on Quarters.

(2) One Cut on One-quarter of the Tree's Circumference. Tapped Daily.

This tree was typical of a number measured in the same field. The age of the trees at the time of examination was eight years, and they had been tapped for one year.

Tree No. 6.

Girth of the t	ree at 3 feet	from the gro	ound		nches. 29
				Millim	ietres.
Thickness of	untapped ba	rk above tap	ped area		6.5
Do.		below	do.		7
Thickness of	bark 2 inche	s from top of	f tapped area	٠.	3
Do.	4	do.	· · ·		2.5
Do.	6	do.			2
Do.	8	do.			2
Do.	10	do.			2
Do.	12	do.			2
Do,	14	do.			2
Do.	16	do,			1

^{*} This figure does not correctly express "percentage of complete renewal," because the "bark" is not completely pured down to the cambium. It is, however, a convenient approximation by which we can compare different renewals.

The renewing bark of the tapped area was of a practically uniform thickness all the way down, and no very active renewal had taken place.

(3) Two Cuts on One-quarter of the Tree's Circumference. Tapped on Alternate Days. One-quarter tapped each Year.

On nearly all these trees three of the quarters had been tapped, the fourth quarter being nearly completed at the time of examination.

Tree No. 7

Tree 1	Vo. 7.		
		1	nches.
Girth at 3 feet from the ground			32
		Millin	ne tre s.
Average thickness of untapped b	ark in neighbourho	od of	
tapped areas		٠.	8.5
Average thickness of renewing	bark on quarter ta	pped	
	3 years previou	sly	8
Do.	2 do.		7
Do.	I do.		7
Do.	in tapping		4 .
Tree 1	Vo. 8.		
The history of this tree was a	similar to that of N	o. 7, e	xcept
that one-quarter had not yet be	een tapped.		
1		I	nches.
Girth at 3 feet from the ground	1		36
8-1		Millin	netres.
Average thickness of untapped	hanle in naighbaucha		101103.
tapped area	perk in neignbourne	04 01	10
Average thickness of renewing	hark on quarter to	unned	10
124 clage unicalies of fellowing	2 years previou		9.5
Do.	1 do.	~-,	8
Do.	in tapping		$2 \cdot 2$
Tree I	No. 9.		
The history of this tree was	similar to that of N		
-		1	nches
kirth at 3 feet from the ground	••		$43\frac{1}{2}$
-		Millin	netres.
Average thickness of untapped	bark in neighbourho	od of	
tapped area			7
lverage thickness of renewing	bark on quarter to	apped	
	3 years previou	sly	5.5
Do.	2 do.		5.5
Do.	1 do.		4
Do.	in tapping		2 . 2

Tree No. 10.

Tree Tro.	10.	
The history of this tree was simi	ilar to that of	
Girth at 3 feet from the ground		Inches $39\frac{1}{2}$
		Millimetres
Average thickness of untapped barl	k in neighbourl	hood of
tapped area		9
Average thickness of renewing bar	k on quarter	tapped
3	3 years previ	
Do,	2 do.	6.5
Do.	1 do.	5.5
Do.	in tapping	2
Tree No. 1	11.	
The history of this tree was sin	milar to that	of Nos. 7, 9,
and 10.		
Clina and an analysis		Inches
Girth at 3 feet from the ground	••	35½
		Millimetres
Average thickness of bark in neighborhood bark to hickness of renewed bar		
	3 years previ	
Do.	2 do.	7
Do.	1 do.	,, 5%
Do.	in tapping	2
Tree No.	12.	
The history of this tree was sim	ilar to that of	
Clinth at 2 feet form the amount		Inches 46
Girth at 3 feet from the ground	••	
		. Millimetres
Average thickness of untapped bar	k in neighbour	
tapped area	,	8
Average thickness of renewed bar		
T)	2 years previ	iously 6
Do.	1 do.	
Do.	in tapping	• • • • • • • • • • • • • • • • • • • •
The ratios of the averages of Bark: Untapped Bark for the		
	various qui	arters are a
follows :		
		enewed Bark
	U	tapped Bark. Per Cent.
Quarter tapped 3 years previou	als:	86.2
Do. 2 do.	401 y	84.1
Do. 1 do.	••	67.8
In tapping	••	07.0
ru michturg	••	31.3

A point of interest that arises here is the question of the relative ratios of renewal of bark on the various quarters. The average of the thickness of the renewing bark on the quarter last tapped at 1 inch from the top of the tapped area was only 3.07 millimetres, of which at least 1 millimetre was bark left untapped by the cooly. This last quarter had been commenced nearly a year before the measurements were taken. Therefore, in not less than nine months only about 2 millimetres had been added to the thickness of the bark by renewal.

On the other hand, the previous quarter was being finished one year before the measurements were taken. The average thickness of the bark at the bottom of the quarter which had been tapped one year previously was 5.5 millimetres, which would correspond to about 4.5 millimetres of renewal. That is to say, that, although there was not more than three months' difference between the times these two portions of bark were tapped, the bark on the previously tapped quarter had renewed more than twice as much as the bark on the quarter in tapping. This would appear to indicate that the bark at the bottom of the quarter tapped previously renewed more rapidly than the bark at the top of the quarter in tapping.

Other general results are that 86 per cent. of the thickness of the untapped bark was attained in from three to four years and 84·1 per cent. in from two to three years, a result which cannot be regarded as other than very satisfactory.

The slow increase after three years is very apparent. In very few cases is renewed bark found to be as thick as corresponding untapped bark. The best renewals are usually about 1 millimetre less in thickness.

It was thought that there might possibly be some difference between the rates of renewal of the top and bottom cuts. With the object of ascertaining whether this was the case, the average thicknesses of the bark halfway down each of the two cuts in tapping were ascertained. The ratio of Renewed Bark: Untapped Bark was 37.8 per cent. for the top cut and 31.6 per cent. for the bottom cut. Whilst there is a difference of 6.2 per cent. in favour of the top cut, the figure is hardly large enough to justify us in drawing a definite conclusion from the difference.

Tapping on Thirds.

(4) One Cut on One-Third of the Tree's Circumference. Tapped Daily.

Tree No. 13.

		1100 110. 1	٠.		
Tappin	g on pre	viously untapped	bark.		
• • •				Twa	ches.
O'-II E a					
Girth of t	ree at 3 ie	eet from the groun	a	•• •	33 ³
				Millime	tres
Thickness	of untar	ped bark in neigl	hourhood o		
area .	, or array	ped bark in noisi	inour inour	or mapped	9
	of renew	ing bark at 2 inche	es from the f	on of the	
Linemico	or remen		pped area	op or the	3
	Do.	4	do.	••	3
	Do.	6	do.		2.5
	Do,	š	do.		2
	Do.	10	do.		2
					_
		Tree No. 1	4.		
m					
Tappin	ig on pre	viously untapped	park.		
				Inc	hes
Girth at 3	feet fron	n the ground		3	3
				Millime	tres.
Average t	hickness a	of untapped bark	in the neigh	hourhood	
	apped are		in the noigh	рощпоон	8.3
		ing bark 2 inches	from the to	on of the	• •
1110101000	0. 10.2011		ed area	op dr this	3.5
	Do.	4	do.		2.5
	Do.	6	do.		3
	Do.	8	do.		3
	Do.	10	do.		3
	Do.	12	do.		3
	Do.	14	do.		2.5
	Do.	16	do.		2
	Do.	12	do.		5
	Do.	14	do.		4.5
	Do.	16	do.		4.5
	Do.	18	do.		4.5
	Do.	20	do.		4
	Do.	22	do.		$3 \cdot 5$
	Do.	24	do.		3.2
	Do.	26	do.		3
	Do.	28	do.		3
	Do.	30	do.		3
		30 32	do.		3 3

Tree No. 17.

Tapping on previously untapped bark. The portion of the tree on which the measurements were taken had not been tapped during the eighteen months preceding examination. The tapping of this area was carried out during the second and third years before the tree was examined.

					1	nches.
Girth of the tree	at 3 feet i	from the groun	d.			$37\frac{1}{2}$
					Millin	netres.
Thickness of the	ıntapped k	ark in the neig	hbourh	ood o	f the	
tapped area						7.5
Thickness of the	bark at 2	inches below	the t	op of	the	
		tapped area		-		5
Do.	4	do.				4
Do.	6	do.				4
Do.	8	do.				3.5
Do.	10	do.				4
Do.	12	do.				4
Do.	14	do.				4
Do,	16	do,				4 .
Do.	18	do.				4
Do.	20	do.				4
Do.	22	do.				3.5
Do.	24	do.				3
Do.	26	do.				3
Do.	28	do.				3
Do.	30	do.				2

On the other side of the tree the untapped bark was 7.5 millimetres thick.

The bark tapped three years before was 4 millimetres thick, and that tapped one year before 3 millimetres thick.

Tree No. 15.

Tapping on bark previous	sly p	rioked with Northy	vay pr	icker.
			1	nches.
Firth at 3 feet from the grou	ınd			$37\frac{1}{2}$
			Millin	netres.
Phickness of bark in neighbo	urho	od of the tapped ar	еа	8
Thickness of renewing bark a	at 2 i	nches from the top :	of the	
		tapped area		3.2
Do.	4	do.		3
Do.	6	do.		3
Do,	8	do.		3
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Millimetres

Thickness of renewing ba	rk at 10 inch	es from the top of	the	
•		tapped area		3
Do.	12	do.		3
Do.	. 14	do.		3
Do.	16	do.		3
Do.	18	do.		2
Do.	20	do.		2
Do.	22	do.		2

On the other side of the tree bark which had been tapped three years previously was 4 millimetres thick.

Tree No. 16.

Tapping on bark which had previously not been tapped or had been pricked only.

Girth at 3 feet from the	ground			nches. 49
			Millim	etres.
Thickness of bark in the Thickness of renewing b				8.2
S .	t	apped area	٠.,	6
Do.	4	do.		5.5
Do.	6	do.		5
Do.	8	do.		5
Do.	10	do.		5

Tree No. 18.

Tapping on renewed bark. Age of tree, eleven years. Two tapping areas were measured.

The first area had been tapped during the second and third years prior to examination.

Thickness of renewed bark which was being re-tapped, $\boldsymbol{\theta}$ millimetres.

Vertical length of tapped surface, 28 inches.

The thickness of the second renewal, taken eighteen months after the tapping had ceased, was everywhere 3 millimetres. That is to say, there was a vertical strip of bark 28 inches long, with a uniform thickness of 3 millimetres.

hickness of bark 2 inches below top of tapped area Do. 4 do Do. 6 do Do. 8 do Do. 10 do Tree No. 19. Tapping on renewed bark. Inthof the tree at 3 feet from the ground Chickness of renewed bark undergoing re-tapping area Do. 4 do Do. 6 do Do. 8 do Do. 8 do Do. 8 do Do. 8 do Do. 10 do Tree No. 20. Tapping on renewed bark. Tapping was in progress a time of examination. Girth of tree at 3 feet from the ground Milling thickness of untapped bark		iollows :—		
Do. 4 do	. 7			Millime
Do. 6 do		es below top	of tapped a	irea
Do. 8 do.	2000		• •	• •
Do. 10 do	~		••	• •
Tree No. 19. Tapping on renewed bark. Titch of the tree at 3 feet from the ground Chickness of renewed bark undergoing re-tapping Chickness of the bark 2 inches below top of the new tapping area Do. 4 do Do. 6 do Do. 8 do Do. 10 do Tree No. 20. Tapping on renewed bark. Tapping was in progress a time of examination. Girth of tree at 3 feet from the ground Milling Thickness of untapped bark Thickness of renewed bark undergoing re-tapping Thickness of the bark 2 inches below the top of the new tapping area Do. 4 do Do. 6 do Do. 6 do Do. 8 do Do. 10 do Do. 10 do Do. 12 do Do. 14 do	20.		• •	• •
Tree No. 19. Tapping on renewed bark. Sirth of the tree at 3 feet from the ground Chickness of renewed bark undergoing re-tapping Chickness of the bark 2 inches below top of the new tapping area Do. 4 do Do. 8 do Do. 10 do Tree No. 20. Tapping on renewed bark. Tapping was in progress a time of examination. Girth of tree at 3 feet from the ground			••	• •
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Tree No. 20. Tapping on renewed bark. Tapping was in progress a time of examination. Thickness of untapped bark Thickness of renewed bark undergoing re-tapping area Do. 4 Do. 6 do Do. 6 do Do. 6 Do. 8 do Do. 10 do Do. 12 do Do. 14 do Do. 12 do Do. 14 do Do. 14 do				
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Do. 6 do.			••	
Do. 8 do			••	••
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Girth of tree at 3 feet from the ground	11 0	•	1 0	. 0
Milling	ime or examination.			L
Milling	Linth of tree at 3 fact fr	om the mou	nd	
Thickness of untapped bark	311111 01 0100 110 0 1000 11	om one grou	, ,	••
Thickness of renewed bark undergoing re-tapping				Millim
Thickness of bark 2 inches below the top of the new tapping area Do. 4 do Do. 6 do Do. 8 do Do. 10 do Do. 12 do Do. 14 do			• •	
Do. 4 do				
Do. 4 do	Thickness of bark 2 incl	hes below the	top of the n	iew tapping
Do. 6 do			••	• •
Do. 8 do Do. 10 do	= ''		••	••
Do. 10 do Do. 12 do Do. 14 do			• •	• •
Do. 12 do Do. 14 do			• •	••
Do. 14 do			••	••
			••	••
Tree No. 21.	Do. 14	do.	••	••
		$Tree\ No.$	21.	
Tapping on renewed bark.				

			Millim	etres,
Thickness of renewed bark t	indergoin	g re-tapping		6.5
Thickness of bark 2 inches b	elow the	top of the tapped	area	3.5
Do. · 4	do.			2.5
Do. 6	do.			2
Do. 8	do.			2
Do. 10	do.			1.5
Do. 12	do.	••		1.5
Do. 14	do.			1.5
T	ree No. 2	19.		
		.~ 1		
Tapping on renewed bar	rk.		Iı	nches.
Girth of the tree at 3 feet fr	rom the g	round		36}
			Millim	
FF 1.1				
Thickness of the renewed be				5
Thickness of the renewed b			apped	1 .
ъ.	are		• •	1.5
Do.	4	do.	• •	1.5
Do.	6	do.	• •	1.5
Do.	8	do.	• •	1.5
Do.	10	do.	• •	1.5
Do.	12	do.	• •	1.5
Do.	14	do.	• •	1.2
Do.	16	do.	••	1.5
I	Tree No. 1	23.		
Tapping on renewed ba	rk.			
11 0			I	nches.
Girth of tree at 3 feet above	e ground		••	49_{4}^{3}
			Millir	netres.
Thickness of untapped bar	k			$9 \cdot 5$
Thickness of renewed bark		ng re-tapping		7
Thickness of bark 2 inches				4
Do. 4	do.			4
Do. 6	do.			3
Do. 8	do.			3
Do. 10	do.	**		3
Do. 12	do.			3
Do. 14	do.			3
Do. 16	do.	••		3
The thickness of bark of	on the ot	ner side of the	Tree to	Dogona.e

The thickness of bark on the other side of the tree, tapped four years before, was 6 millimetres.

In the case of tree No. 14 the renewing bark after three years was only 53·3 per cent. of the thickness of untapped bark, as

against 84.1 per cent. in the case of trees Nos. 7-12, which were tapped by two cuts on one-quarter on alternate days.

In the case of tree No. 15 the percentage renewal was 50 per cent. In the case of tree No. 18 the percentage of renewal on re-tapping renewed bark 6 millimetres thick was 50 per cent. after three years, thus leaving a vertical strip of bark 2 feet in length and only 3 millimetres, or about 1th inch, thick.

Only in the case of tree No. 23 was a satisfactory renewal observed, the percentage renewal being 85.7 per cent. after four years.

In the case of tree No. 22 a vertical strip of bark 16 inches long was only 1.5 millimetres thick, or about 1.7 th inch. As 1.5 millimetres is the thickness of bark that should always be left untapped on the cambium, it would appear that during the previous eighteen months or two years no renewal had been taking place.

On the whole, therefore, the bark renewal of trees Nos. 13-23 was exceedingly poor.

It must be recorded here that the trees examined were growing on various estates in the Western Province of Ceylon, and that the actual handiwork of the tappers was good, as judged by freedom from wounds.

The probable causes of the poor bark renewal will be discussed later.

(5) One Cut on One-half of the Tree's Circumference. Tapped Daily, and on only one side of the Tree.

Tree No. 24.

This tree was eight years old at the time of examination, and had been tapped for two years.

			I	nches.
Girth at 3 feet above g	round level	••		30}
			Millin	netros.
Thickness of untapped	bark			7.5
Thickness of renewing l	oark 2 inches fo	rom top of te	apped area	5.5
Do.	4	do.		4.5
Do.	6	do.		4
Do.	8	do.		4
Do.	10	do.		4 .

Millimetres.

Thickness of renewing	bark 12 inches	from ton of to	nned eree	3
Do.	14	do.	ippou arou	3
Do.	16	do.	• • • • • • • • • • • • • • • • • • • •	2
Do.	18	do.		$\bar{2}$
Do.	20	do.		ī
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	20	uo.	••	•
	Tree No.	25.		
The history of this	tree was simi	lar to that	of No. 24.	
J				ohes.
Citib at D fact aleas				301
Girth at 3 feet above	ground rever	••	••	302
			Millim	\mathbf{etres} .
Thickness of untappe	d bark	••		6.5
Thickness or renewing	bark 2 inches l	celow top of t	apped area	4
Do.	4.	do.	••	4
Do.	6	do.	• •	3
Do.	8	do.	••	3
Do.	10	do.	• •	2.5
Do.	12	do.	••	1.5
Do.	14	do.	• •	1.2
Do.	16	do.		ì
Do.	18	do.		1
Do.	20	do.		t
	Tree No. 2	26.		
The history of this	tree was simil	ar to that o	f Nos. 24 an	d 25.
			Iı	nches.
Girth at 3 feet above	ground level	••		$29\frac{1}{2}$
			Millim	etres,
Thickness of untappe	d bark			7.5
Thickness of renewing		from ton of t	anned area	5
Do.	4	\ do.		5
Do.	6	do.		4
Do.	š	do.		3.5
Do.	10	do.		3.5
Do.	12	do.		4
Do.	14	do.		3.5
Do.	16	do.		2
Do.	18	do.		2
Do.	20	do.	1.	1.5

The average of the renewal of the bark of trees Nos. 24-26 for two years was 67 per cent., and after one year 46 per cent. The length of time of renewal was perhaps too short for us to judge equitably the renewal.

The third year might indeed have added another millimetre to the thickness of the renewing bark.

It must be noted that the bark of the lower 8 inches of the pared area of tree No. 25 was nowhere thicker than 1.5 millimetres.

(6) One Cut on One-half the Tree's Circumference. Tapped on Alternate Days.

Tree No. 27.

This tree had been tapped on one side for two years, the breadth of the strip of bark removed being 15½ inches measured vertically.

Girth at 3 feet above	ground level		Inches 29}
			Millimetres.
Thickness of untappe	d bark		8
Thickness of renewing	bark 2 inches fr	om top of ta	pped surface 5
Do.	4	do.	5
Do.	6	do.	4
Do.	8	do.	3.5
Do.	10	do.	3
Do.	12	do.	3
Do.	14	do.	3*

^{*} Tapped about nine months before measurement.

Tree No. 28.

This tree was tapped two years on one side only, the breadth of the strip of bark removed being 14 inches measured vertically.

			lneb	ies.
Girth at 3 feet	above ground level		30	١,
			Millimetr	res.
Thickness of u	ntapped bark		8	\$
Thickness of re	nowing bark 2 inches	s from top of tar	ped area 6	i
Do.	4	do. 1	5	ś
Do.	в	do.	5	
Do.	8	do.	5	5
Do.	10	do.	5	, ,
Do.	12	do.		5
Do.	14	do.	4.	5*

^{*} Tapped one year before examination.

Tree No. 29.

This tree had been tapped on one side from three years until eight months before examination, the tapping being carried out on previously untapped bark.

•	T	nches,
Girth at 3 feet above ground level		32
1	Millin	netres.
Thickness of untapped bark		8
Thickness of renewing bark 2 inches below top of tapped a	roa	6
Do. 4 do.		4.5
Do. 6 do.		4
Do. 8 do.		4
Do. 10 do.		4
$\overline{\mathrm{Do}}$, 12 do.		3
Do. 14 do.		3
Do. 16 do.		3
Do. 18 do.		2

Tree No. 30.

One side of the tree had been tapped from three years until the time of examination.

the time of t	200			I	nches.
Girth at 3 fee	t above ground	l level	• •		30
				Millin	netres.
Thickness of	untapped bark		• •		8.5
Thickness of	renewing bark	2 inches fro	m top of tapped	area	4
	0.	4	do.		4.5
D	o.	6	do.		5
D	ю.	8	do.		5
Ľ	lo. 1	0	do.		4.5
: D	0. 1	2	do.		3
D	1.	4	do		ī

The renewal of the bark of trees Nos. 27, 28, 29, and 30 after about two and a half years was about 60 per cent. This bark renewal was therefore somewhat poor, as compared with trees Nos. 7-12, but in this case the tree had two and a half years for renewal, as against three years.

(7) One Cut on One-half of the Tree's Circumference. Tapped on Alternate Days. Tapping transferred to the other side of the Tree every Six Months.

Tree No. 31.

	Inches.
Girth at 3 feet above ground level	 32½

				Millime	etres.
Thickness of untapped bar	rk				7.5
Thickness of renewing bar	k tappe	d 3 years	previously		6.0
Do.		2	ao.		5.5
Do.		1	do.	••	4
Similar measurements	were ta	aken on	the other	side of	f the
tree.				Millim	
				WHITTH	
Thickness of untapped ba	rk		1	• •	9 7·5
Thickness of bark tapped	3 years	previous	siy	٠.	5
Do.	_	do. do.		• • •	4
Do.	1	ao.		••	*
	Tree No	o. 32.			
				L	nches.
Girth at 3 feet above grou	ınd level	l			34
		•		Millim	etres.
Thickness of untapped ba	rk				8
Thickness of renewing bar	k tappe	d 3 years	s previously	• ••	7
Do.		2 *	do.		5
Do.		1	do.		5
	Tree N	o. 33.			
				I	nches.
Girth at 3 feet above grou	ınd level	l			$33\frac{1}{4}$
				Millim	etres.
Thickness of untapped ba	rk				9
Thickness of bark tapped		previous	lv		6
Do.		do.	-5		5
Do.	1/2	do.			3
On the other side of t	he tree	the thicl	kness of th	e unta	nned
bark was 8 millimetres					
	•		0		
years previously 5 milli		and tha	t of bark	tapped	1 one
year previously 4 millim	etres.				
	Tree N	. 21			
	1 TEE IV	0. 54.		т,	nckes.
Cinth at 9 fact al				1	
Girth at 3 feet above grou	ind love	1	,	• •	28
				Millim	etres,
Thickness of untapped ba	rk				7.5
Thickness of renewing bar	k 2 inch	es from to	op of tapped	l area	5
Do.	4	do).		5
Do.	6	do).		5
6(8)17					

	, 10	1		
			Millim	etres.
Thickness of renewin	a hark Sinches	from ton of tanne	d area	6
Do.	10	do.		5
Do.	12	do.		4.5
Do.	14	do.		4
Do.	16	do.	• •	3
	Tree No.	<i>35</i> .		
			I:	nches,
Girth at 3 feet above	ground level			35
			Millin	netres,
Thickness of untapp	ed bark			11
Thickness of renewing	z bark 2 inches	from top of tappe		8
Do.	4	do.		9
Do.	6	do.	• •	9
Do.	. 8	do.	••	9
Do.	10	do.	• •	8.5
Do.	12	do.	••	8·5
Do. Do.	14 16	do. do.	••	8
Do. Do.	18	do.	• • • • • • • • • • • • • • • • • • • •	10
This tapping had and fourth years be		~	econd,	third,
	Trees Nos.	<i>36–40</i> .		
These trees were and were tapped for being so tapped for the system subsequ tree's circumferenc tree every six mont	st when six ye six months one lently adopted e, changed ov	ars old with two e of the cuts was being one cut	cuts. disconti over ha	After nued, lf the
	Tree No.	. 36.		
			I	nches.
Girth at 3 feet above	e ground level	••		$36\frac{1}{2}$
			Millin	netres.
Thickness of untapp		ing as tanning	••	8 7
Thickness of renewed Thickness of renewed Do.	u bark underge d bark tapped	ong re-tapping 2½ years before 6 months	• • • • • • • • • • • • • • • • • • • •	6 5

Tree No. 37:

Girth at 3 feet above ground level

Inches.

.. 441

		Millim	etres.
Thickness of untapped bark			9
Thickness of renewed bark undergrands. Thickness of renewing bark tapped	oing re-tapping	••	7·5 7
Do.	6 months	• • •	5
Tree No	. 38.		
Girth at 3 feet above ground level	••	I	32 3
,		Millim	etres.
Thickness of untapped bark	1.01	••	8
Thickness of renewing bark tapped Do.	1 2½ years before 6 months	• •	6 51
10.	o monons	••	02
Tree No	. 39.		. *
			nches.
Girth at 3 feet above ground level	• •	••	371
		Millim	otres.
Thickness of untapped bark	,	••	9
Thickness of bark tapped 3 years p Do. 6 month	previously	••	7 5
			-
The thickness of the renewing			
tree tapped from three years to	six months prev	riously	was
from 9-7.5 millimetres.			
Tree No	. 40.		
		I	nches.
Girth at 3 teet above ground level	••		46½
		Millim	Atres
Thickness of untapped bark			9.5
Thickness of bark tapped 3 years	before	• • •	7
Do. 6 month	s	• •	4
Tree No	41.		
2,002,0		т.	achos.
Girth at 3 feet above ground level			
above ground level	••	••	0.2
TVL:1		Millim	etres.
Thickness of untapped bark		••	9.5
Thickness of renewing bark 2 inches Do. 4	trom top ot tapped do.	area.	8 7
Do. 6	do.	•••	7

				Millim	etres.
Thickness of re	enewing har	k 8 inches f	rom top of	tapped area	7
Do).	10	do.	••	6
Do),	12	do.		6
\mathbf{D}_{0}) .	14	do.		5.5
$\mathbf{D}_{\mathbf{c}}$	o.	16	do.		5
Do	o.	18	do.		5
\mathbf{D}_{0}	Э.	20	do.	• •	5
\mathbf{D}_{0}	ο.	22	do.	••	5
		Tree No.	42.		
				I	nches,
Girth at 3 fee	t above gro	und level	••		28
				Millin	
Thickness of	untapped ba	rk			7.5
Thickness of	bark 2 inche	s below to	p of tappe	darea	5
Do.	4	do.			5
Do.	6	do.	••		5
Do.	8	do.	• •	••	6
Do.	10	do.	• •	*, *	5
Do.	12	do.	• •	••	4.5
Do.	14	do.	• •	••	4
Do.	16	do.	• •	••	.)
		Tree No.	4.3		
			40.		
		1,00 1,00	10.]	nches.
Girth at 3 fee	t above gro				inches. 35
Girth at 3 fee	t above gro				35
		und level		Millir	35 netres.
Thickness of	untapped be	und level		Millir	35 netres. 11
Thickness of Thickness of r	untapped be conowing bar	und level ark ek 2 inches	 from top o	Millir	35 netres. 11 8
Thickness of Thickness of D	untapped be concwing bar	und level ark ck 2 inches	 from top o do.	Millir of tapped area 	35 netres. 11 8 9
Thickness of Thickness of D	untapped be conewing bar co.	und level ark ek 2 inches 4 6	 from top o do. do.	Millin Millin of tapped area 	35 metres. 11 8 9
Thickness of Thickness of D	untapped be concwing bar co. co.	und level ark k 2 inches 4 6 8	from top o do. do. do.	Millin Millin of tapped area 	35 netres. 11 8 9
Thickness of Thickness of D	untapped be concwing bar o. o. o.	und level ark ck 2 inches 4 6 8	from top o do. do. do. do.	Millin Millin of tapped area 	35 netres. 11 8 9 9
Thickness of r Thickness of r D D D D	untapped be concwing bar o. o. o.	und level ark k 2 inches 4 6 8	from top o do. do. do.	Millir Millir of tapped area 	35 metres. 11 8 9 9 9
Thickness of Thickness of D D D D D D D D D D D D D D D D D D	untapped be conewing bar o. o. o.	und level ark ck 2 inches 4 6 8 10 12	from top o do. do. do. do. do.	Millir Millir of tapped area 	35 metres. 11 8 9 9 8.5 8.5
Thickness of Thickness of D D D D D D D D D D D D D D D D D D D	untapped be concwing bar o. o. o.	und level ark ck 2 inches 4 6 8 10 12	from top o do. do. do. do. do. do.	Millir of tapped area of	35 netres. 11 8 9 9 8.5 8.5 8
Thickness of Thickness of D D D D D D D D D D D D D D D D D D D	untapped be conceving bar to. to. to. to.	und level ark k 2 inches 4 6 8 10 12 14 16 18	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8
Thickness of Thickness of D D D D D D D D D D D D D D D D D D D	untapped by concwing bar oo. oo. oo. oo. oo. oo. oo. oo. oo. oo	und level ark k 2 inches 4 6 8 10 12 14 16 18 o years pri	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8
Thickness of Thickness of D D D D D D D D D D D D D D D D D D D	untapped by concwing bar oo. oo. oo. oo. oo. oo. oo. oo. oo. oo	und level ark k 2 inches 4 6 8 10 12 14 16 18	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8
Thickness of Thickness of D D D D D D D D D D D D D D D D D D D	untapped be concwing bar o. o. o. o. o. o. o. o. o. o.	und level ark k 2 inches 4 6 8 10 12 14 16 18 10 representation of the second of the s	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8 8 10*
Thickness of r Thickness of r D D D D D D D D	untapped be concwing bar o. o. o. o. o. o. o. o. o. o.	und level ark k 2 inches 4 6 8 10 12 14 16 18 10 representation of the second of the s	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8 8 10*
Thickness of Thickness of Thickness of D D D D D D D D D D D D D D D D D D D	untapped beconowing bar o.	und level ark 4 2 inches 4 6 8 10 12 14 16 18 19 o years pri Tree No.	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8 10* Inches. 29½
Thickness of Thickness of Thickness of DD	untapped be conceined bar on the conceined bar of t	und level ark ck 2 inches 4 6 8 10 12 14 16 18 0 years pri Tree No. bound level	from top of do.	Millir of tapped area	35 metres. 11 8 9 9 9 8.5 8.5 8 10* Inches. 29½ metres.
Thickness of	untapped be concwing bar on one one	und level ark ck 2 inches 4 6 8 10 12 14 16 18 0 years pri Tree No. bound level	from top o do. do. do. do. do. do. do. do. do. d	Millir of tapped area	35 netres. 11 8 9 9 9 8 5 8 5 8 10* Inches. 29½ metres. 8
Thickness of Thickness of Thickness of DD	untapped be concwing bar on one one	und level ark ck 2 inches 4 6 8 10 12 14 16 18 0 years pri Tree No. bound level	from top o do. do. do. do. do. do. do. do. do. d	Millir of tapped area	35 metres. 11 8 9 9 8.5 8.5 8 10* Inches. 29½ metres. 8 6

Trees Nos. 31-33 showed an average renewal of 79 per cent. of the thickness of original bark in two years, and 48 per cent. in from six months to one year.

Tree No. 34 showed a renewal of 67 per cent. at the top of the tapped area 16 inches long, and 40 per cent. at the bottom.

Tree No. 35 showed a renewal of 82 per cent. for bark tapped four years before, and 73 per cent. for bark tapped two years before.

Trees Nos. 36 and 37 were examples of re-tapped bark. In two and a half years renewing bark was 83 per cent. of the thickness of the renewed bark, which was being tapped over again. In six months the renewal was 69 per cent. In the cases of Nos. 38 and 39 the tapping was carried out on original bark.

Tree No. 38 showed a renewal of 75 per cent, after two and a half years and 69 per cent. after six months.

Trees Nos. 39 and 40 showed a renewal of 76 per cent. after three years and 49 per cent. after six months.

Tree No. 43 showed a renewal of 73 per cent. after both two and four years.

Tree No. 44 showed a renewal of 75 per cent. in three years and 50 per cent. in one year.

(8) Two V Cuts on One-half of the Tree's Circumference. Tapping transferred to the other side of the Tree about every Six Months.

Trees Nos. 47-52 were planted twelve years before examination. They were tapped first with five cuts, which number was gradually decreased year by year until reduced to two cuts two years before the examination was made.

A large number of measurements was made on each tree, but only the more important figures are given here.

Tree No. 45.

(22)						
			Millim	etres			
Thickness of untapped bark				8			
Thickness of renewing bark tappe	ed 3 y	ears previously do.	•••	7 5			
Do. Do.	í	do.	• • • • • • • • • • • • • • • • • • • •	อ 5			
0.0							
Tree N	o. 46						
			Ŀ	nches.			
Girth at 3 feet above ground leve	d	••	• •	33			
			Millin	ietres.			
Thickness of untapped bark		, .	• •	8			
Thickness of renewing bark tappe	d 3 ye 2		• • •	6			
Do. Do.	1	do. do.	••	5 3			
D 0.	у.	u 0.	••	٠			
Tree N	o. 47	•					
			1	nches.			
Girth at 3 feet above ground leve	el	••		361			
			Millin	netres.			
Thickness of untapped bark		••		7.5			
Thickness of renewing bark tappe				6.2			
Do. Do.	1	do. do.	• •	6.2			
100.	1/2	ao.	••	3 .			
Tree A	lo. 48	•					
	Inches,						
Girth at 3 feet above ground leve	əl	• •		35			
			Millir	netres.			
Thickness of untapped bark				7.5			
Thickness of renewing bark tappe				6.2			
Do.	1	do.	••	6			
Do.	i i	do.	••	4.5			
Tree N	To. 49						
			3	inches.			
Girth at 3 feet above ground leve	əl			$35\frac{3}{4}$			
			Millir	netres.			
Thickness of untapped bark				8			
Thickness of renewing bark tappe	ed 5 y	ears previously	٠.,	7			
Do.	1	do.	• •	8			
Do.	1/2	do.	••	3			
Tree No. 50.							
2,002]	Inches.					
Girth at 3 feet above ground leve	al			$24\frac{1}{2}$			
9							

			Millin	setres.					
Thickness of untapped bark				7.5					
Thickness of renewing bark tapped	d 5 year	s previousl	y	5.5					
. Do.	1	do.		4					
Do.	1/2	do.		3					
Tree No. 51.									
			I	nches.					
Girth at 3 feet above ground level	••		••	$33\frac{1}{2}$					
			Millin	netres.					
Thickness of untapped bark				5					
Thickness of renewing bark tapped	5 years	before		4.5					
Do.	1	do.		3.5					
Do.	1/2	do.	••	3					
Tree No. 52.									
			I	nches.					
3 frith at 3 feet above ground level	••			$28\frac{3}{4}$					
			Millin	etres.					
Thickness of untapped bark			٠.	7					
Thickness of renewing bark tapped	5 years	previously		6					
Do.	1	do.		5					
Do.	$\frac{1}{2}$	do.		3					

The averages of the renewals of trees Nos. 47-52 were as iollows:—After five years the renewing bark was 85 per cent. of the thickness of untapped bark; after one year it was 77 per cent. of that thickness.

Trees Nos. 45 and 46 showed an average of 79 per cent. enewal after three years and 48 per cent. after one year.

Conclusions.

The measurements show that the trees tapped daily hroughout the year resulted in a poor bark renewal, as compared with trees tapped on alternate days and every hird day.

Of the trees examined, good first renewals were shown by hose tapped by two cuts on one-quarter, one cut sloping ipwards to the left on one-half, and two V cuts on one-half. In the first case one-quarter was tapped each year, in the econd and third cases tapping was transferred to the other ide of the tree about every six months. In the case of first tapping, if the renewal bark is 85 per cent. of the thickness of the untapped bark within three years of tapping, the renewal may be considered to be good.

After first tapping the renewed bark in only very exceptional cases becomes as thick as the corresponding untapped bark, there usually being a difference in thickness of about one millimetre.

In the case of the tapping on quarters, an area renewed most rapidly during the year following discontinuance of tapping on that quarter.

The bark of some old trees which had been severely tapped appeared to have an almost uniform thickness of about 5 millimetres, about 50 per cent. of the thickness of untapped bark.

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